

3.1 Environmental Protection Department

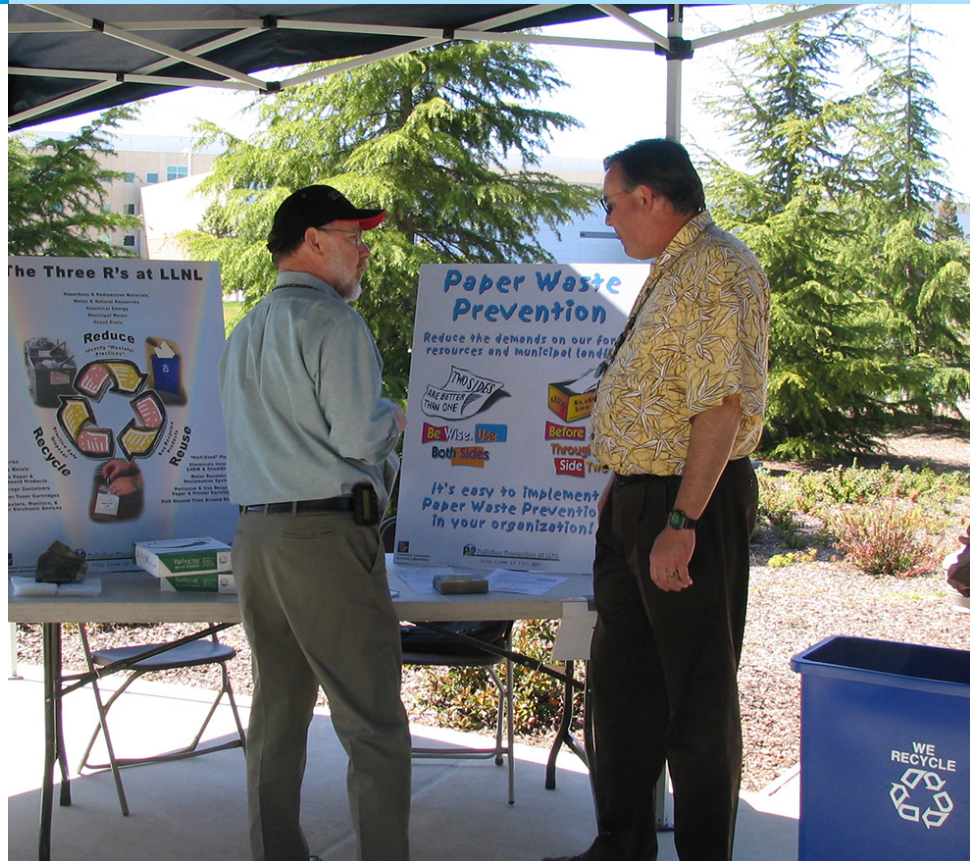
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Lawrence Livermore National Laboratory is committed to enhancing its environmental stewardship and to reducing any impacts its operations may have on the environment.

The Environmental Protection Department (EPD) is LLNL's lead organization in environmental protection and provides environmental expertise to the Laboratory. EPD's major activities are described in this chapter. In 2006, one of EPD's most important undertakings was integrating the requirements of the International Organization for Standardization (ISO) 14001:2004 Environmental Management Systems (EMS) into LLNL's Integrated Safety Management System (ISMS). The development of LLNL's EMS is described in this chapter.

Pollution prevention, a significant component of the EMS, plays an important role at LLNL. The progress the Pollution Prevention Program (P2 Program) has made in meeting U.S. Department of Energy (DOE) pollution prevention goals, diverting waste, and reducing generated waste is described in this chapter.

Award-winning projects and training and awareness programs are also described.

3.1 Environmental Protection Department

EPD is responsible for environmental monitoring, environmental regulatory interpretation and implementation guidance, environmental restoration, and waste management in support of LLNL's programs. EPD also works with the Public Affairs Office to implement an environmental community relations program. EPD prepares and maintains environmental plans, reports, and permits; maintains the environmental portions of the *Environment, Safety and Health Manual (ES&H Manual)*; informs management about pending changes in environmental regulations pertinent to LLNL; represents LLNL in day-to-day interactions with regulatory agencies and the public; and assesses the effectiveness of pollution control programs.

EPD monitors air, sanitary sewer discharges, groundwater, surface water, rain, soil, sediment, vegetation, foodstuff, and direct radiation; evaluates possible contaminant sources; and models the impact of LLNL operations on humans and the environment. The monitoring activities in 2006 are presented in the remaining chapters of this report.

A principal part of EPD's mission is to work with LLNL programs to ensure that operations are conducted in a manner that limits environmental impact and that they are in compliance with regulatory requirements. Specifically, EPD helps LLNL programs manage and minimize hazardous, radioactive, and mixed wastes and identify opportunities for pollution prevention, including minimization of nonhazardous waste. EPD also determines the concentrations of environmental contaminants remaining from past activities, cleans up environmental contamination to acceptable standards, responds to emergencies to minimize and assess impact on the environment and the public, and provides training programs to improve the ability of LLNL employees to comply with environmental regulations.

EPD is divided into three divisions: Operations and Regulatory Affairs (ORAD), Radioactive and Hazardous Waste Management (RHWM), and Environmental Restoration (ERD).

3.1.1 Operations and Regulatory Affairs Division

ORAD specializes in environmental compliance and monitoring and provides LLNL programs with a wide range of information, data, and guidance to enable managers to make informed environmental decisions. Specifically, ORAD

- prepares environmental permit applications and related documents for submittal to federal, state, and local agencies

- provides the liaison between LLNL and regulatory agencies conducting environmental inspections
- tracks chemical inventories
- prepares National Environmental Policy Act (NEPA) documents and conducts related field studies
- oversees wetland protection and floodplain management requirements
- coordinates cultural and wildlife resource protection and management
- facilitates and provides support for the P2 and recycling programs
- teaches environmental training courses
- coordinates the tank environmental compliance program
- coordinates Spill Prevention Control and Countermeasure and storm water compliance programs
- coordinates wastewater discharge compliance programs
- provides guidance to LLNL operations on regulatory requirements and compliance strategies
- conducts compliance and surveillance monitoring
- provides environmental impact modeling and analysis, risk assessment, and reporting
- develops new methods and innovative applications of existing technologies to improve environmental practices and assist LLNL in achieving its mission
- supports the development and implementation of EMS

ORAD also actively assists in responding to environmental emergencies such as spills. During normal working hours, an environmental analyst from the ORAD Environmental Operations Group (EOG) responds to environmental emergencies and notifies a specially trained Environmental Duty Officer (EDO). EDOs are on duty 24 hours a day, seven days a week, and coordinate emergency response with the first responders and environmental specialists.

3.1.2 Radioactive and Hazardous Waste Management Division

RHWM manages all hazardous, radioactive, and mixed wastes generated at LLNL facilities in accordance with local, state, and federal requirements. RHWM processes, stores, packages, treats, and prepares waste for shipment and disposal, recycling, or discharge to the sanitary sewer. As part of its waste management activities, RHWM tracks and documents the movement of hazardous, mixed, and radioactive wastes from waste accumulation areas (WAAs), which are typically located near the waste generator, to final disposition; develops and implements approved standard operating procedures; decontaminates LLNL equipment; ensures that containers for shipment of waste meet the specifications of the U.S. Department

of Transportation and other regulatory agencies; responds to emergencies; and participates in the cleanup of potential hazardous and radioactive spills at LLNL facilities. RHWMM prepares numerous reports, including the annual and biennial hazardous waste reports required by the California and U.S. Environmental Protection Agencies. RHWMM also prepares waste acceptance criteria documents, safety analysis reports, and various waste guidance and management plans.

RHWMM meets regulations for the treatment of LLNL's mixed waste in accordance with the requirements of the Federal Facilities Compliance Act. The schedule for this treatment is negotiated with the State of California and involves developing new on-site treatment options as well as finding off-site alternatives. The Legacy Waste program was officially completed in November 2005.

3.1.3 Environmental Restoration Division

ERD was established to evaluate and remediate soil and groundwater contaminated by past hazardous materials handling and disposal practices and from leaks and spills that have occurred at the Livermore site and Site 300 prior to and during LLNL operations. ERD conducts field investigations at both the Livermore site and Site 300 to characterize the existence, extent, and impact of contamination. ERD evaluates and develops various remediation technologies, makes recommendations, and implements actions for site restoration. ERD is responsible for managing remedial activities, such as soil removal and groundwater and soil vapor extraction and treatment, and for assisting in closing inactive facilities in a manner designed to prevent environmental contamination. As part of its responsibility for Comprehensive Environmental Response Compensation and Liability Act (CERCLA) compliance issues, ERD plans, directs, and conducts assessments to determine both the impact of past releases on the environment and the restoration activities needed to reduce contaminant concentrations to protect human health and the environment. Public workshops are held regularly, and information is provided to the public as required in the ERD CERCLA Community Relations Plans. CERCLA activities in 2006 are summarized in **Section 2.1 (Chapter 2)**. ERD's groundwater remediation activities in 2006 are described further in **Chapter 8**.

3.1.4 Response to Spills and Other Environmental Emergencies

All spills and leaks (releases) at LLNL that are potentially hazardous to the environment are investigated and evaluated. The release response process includes identifying the release, shutting off the source (if it is safe to do so), eliminating ignition sources, contacting appropriate emergency personnel, cordoning off the area containing the released material, absorbing and neutralizing the released material, assisting in cleanup, determining whether a release must be reported to regulatory agencies, and verifying that cleanup (including

decontaminating and replenishing spill equipment) is complete. ORAD staff also provide guidance to the programs on preventing spill recurrence.

As previously described, the EDO is available 24 hours a day, seven days a week, to maximize efficient and effective emergency environmental response. Specialized EDO training includes simulated incidents to provide response personnel with the experience of working together to mitigate an environmental emergency, determine any reporting requirements to regulatory agencies and DOE, and resolve environmental and regulatory issues within the LLNL emergency response organization. The on-duty EDO can be reached by pager or cellular phone at any time.

During normal working hours, LLNL employees report any environmental incidents to an EOG environmental analyst assigned to support their program area. The EOG environmental analyst then notifies the on-duty EDO of the incident, and together with other ORAD staff, the team determines applicable reporting requirements to local, state, and federal regulatory agencies and to DOE. The EDO and EOG environmental analysts also notify and consult with program management and have seven-day-a-week, 24-hour-a-day access to the Office of Laboratory Counsel for questions concerning regulatory reporting requirements.

During off hours, on-site LLNL employees report environmental incidents to the LLNL Fire Dispatcher who notifies the EDO and the LLNL Fire Department if required. The EDO then calls for additional EPD support to the incident scene as necessary and follows the same procedures as outlined above for normal working hours.

3.2 Integrated Safety Management System

LLNL implements an Integrated Safety Management System (ISMS), which is designed to ensure the systematic integration of environment, safety, and health (ES&H) considerations into management and work practices so that missions are accomplished safely. “Safety” in this context is synonymous with environment, safety, and health and encompasses protection of the public, workers, and the environment, including pollution prevention and waste minimization. LLNL regards protection of the environment as an essential component of its overall safety management system.

The core requirements of the ISMS are based on DOE’s Seven Guiding Principles: (1) line management is responsible for safety, (2) roles and responsibilities are clear, (3) competence is commensurate with responsibilities, (4) priorities are balanced, (5) safety standards and requirements are identified, (6) hazard and environmental aspect controls are tailored to the work being performed, and (7) operations are authorized.

How LLNL manages and performs work can be described by DOE’s Five Core Functions: (1) define the scope of work, (2) analyze the hazards and environmental aspects, (3) develop and implement hazard and environmental aspect controls, (4) perform work within controls, and (5) provide feedback and continuous improvement.

In 2006, LLNL enhanced the environmental emphasis of the ISMS even further by upgrading from ISO 14001:1996, Environmental Management Systems (EMS), to ISO 14001:2004. ISO 14001 defines an EMS as that “part of the overall management system used to develop and implement its environmental policy and manage its environmental aspects.” The EMS is based on requirements relating to the following five EMS principles: (1) define an environmental policy and ensure commitment to its EMS, (2) formulate a plan to fulfill the environmental policy, (3) develop the capabilities and support mechanisms necessary to achieve the environmental policy, objectives, and targets, (4) measure, monitor, and evaluate environmental performance, and (5) review and continually improve the EMS with the objective of improving overall environmental performance.

An EMS that is based on these principles and functions results in accountability at all levels, project planning that includes environmental protection, and excellence in program execution. The ISMS at LLNL employs a process of assessing hazards and the environmental implications of work, designing and implementing standards-based methods intended to control risks and reduce the negative impacts of work activities to meet established targets and objectives, and complying with applicable ES&H requirements. The ISMS in effect at LLNL in 2006 was *Integrated Safety Management System Description, Version 8* (LLNL 2005) and is available at http://www.llnl.gov/es_and_h/ism/ism-descriptionv8.pdf.

3.2.1 Work Smart Standards

The Work Smart Standard (WSS) set is a comprehensive set of standards that are derived from statutes, regulations, DOE orders, University of California (UC) and LLNL policies, and industry work standards. An integral part of the LLNL ISMS, the WSS set establishes workplace ES&H controls and defines the ES&H requirements at LLNL. ES&H professionals at LLNL use WSSs to identify hazards and environmental aspects^(a) and to establish standards of operation for specific work environments.

The original WSSs were selected using a process that included review and recommendation by LLNL and DOE subject matter experts. Currently, the WSS set is revised through a formal process managed by the WSS Change Control Board, which consists of representatives from DOE, UC, and LLNL. WSSs may need to be revised when DOE orders, regulations, and other applicable standards are issued or revised or as a result of the periodic review of the WSS set by LLNL subject matter experts to ensure that it is current and complete.

This environmental report was developed in accordance with the WSSs in place during 2006 in the DOE/UC/LLNL Prime Contract W-7405-ENG-48, Appendix G. In May 2007, DOE selected Lawrence Livermore National Security (LLNS), LLC, to manage the Laboratory. LLNS takes over the management of the Laboratory on October 1, 2007. At that time, the

(a) Environmental aspects are elements of an organization's activities, products, or services that can interact with the environment.

requirements in the contract will change but should not have a significant impact on the requirements related to the preparation of this report.

3.2.2 Environmental Management System

LLNL established its Environmental Management System (EMS) to meet the requirements of ISO 14001:1996, which was adopted by LLNL as a WSS in June 2004. LLNL self-declared its conformance with ISO 14001:1996 in December 2005. The National Nuclear Security Administration/Livermore Site Office (NNSA/LSO) subsequently validated LLNL's conformance with the condition that LLNL complete a corrective action plan (CAP) on 13 minor nonconformances. LLNL's completion of the CAP is described in **Section 3.2.6**. In 2006, LLNL began the process of upgrading its EMS to meet the requirements of ISO 14001:2004.

LLNL's EMS promotes responsible environmental stewardship practices that are protective of the air, water, land, and other natural and cultural resources; complies with applicable environmental regulations in a cost-effective manner; and focuses on continuous improvement of LLNL's environmental system. LLNL's senior management has committed to achieving continuous improvement in operational and environmental performance through P2 and other sustainable business tools.

3.2.2.1 Overview and General Requirements

The LLNL EMS is applicable to all on- and off-site activities, products, and services that LLNL can control and over which it can be expected to have an influence. LLNL Nevada Test Operations are subject to the requirements of the Nevada Test Site and are not addressed in the LLNL EMS.

The LLNL EMS centers on the management of environmental aspects in accordance with ISMS requirements. All LLNL organizations are responsible for supporting institutional environmental objectives and targets where appropriate, as well as for managing and reducing the negative impacts of significant environmental aspects that are specific to the organization and its work activities, products, and services. All LLNL environmental aspects and regulatory or other identified requirements are managed according to the *ES&H Manual*.

P2 is a critical part of the LLNL EMS. **Table 3-1** describes the connection between P2 and the elements of the EMS.

3.2.2.2 Environmental Policy

On July 22, 2004, the Laboratory Director issued LLNL's environmental policy, which was distributed to all LLNL employees. The policy is the basis on which the EMS was developed and is as follows:

LLNL is committed to providing responsible stewardship of the environmental resources in our care. Environmental stewardship is integrated into our strategic planning and decision-making processes and into the management of our work activities through the Integrated Safety Management System.

In support of this policy, LLNL has committed to

- work to continuously improve the efficient and effective performance of the EMS
- comply with applicable environmental laws and regulations
- incorporate pollution prevention, waste minimization, and resource conservation into the planning and decision-making processes
- ensure that interactions with regulators, DOE, and community are based on integrity, openness, and adherence to national security requirements
- establish appropriate environmental objectives and performance indicators to guide these efforts and measure progress (*ES&H Manual*, Document 1.2, ES&H Policies of LLNL, Section 3.0)

3.2.3 Identification of Significant Environmental Aspects and Their Impacts

The ISO 14001 standard requires the identification, determination of significance, and mitigation of environmental aspects to drive and measure improvements in environmental protection performance within work activities, products, and services. Significant

Table 3-1. Pollution prevention in LLNL's Environmental Management System.

EMS Element	Connection to Pollution Prevention (P2)
Environmental commitment and policy	P2 is included in LLNL's environmental policy signed by the Laboratory Director.
Planning	<p>P2 principles are assimilated into environmental planning and decision-making at the institutional and directorate levels.</p> <p>The P2 Opportunity Assessment (PPOA) is part of a process to identify significant aspects.</p> <p>PPOAs are also employed to evaluate EMS objectives, targets, and mitigation approaches in terms of environmental benefit and technical and economic feasibility.</p>
Implementation and operation	The P2 Team provides support to the EMS Team in project expertise, database interface, financial support identification, document preparation, self-assessments, interfacing with the community, and performance testing.
Checking and corrective action	Corrective actions are accomplished through return-on-investment projects, process changes funded by programs, and informal cooperation between LLNL programs, P2 Team staff, and EPD environmental analysts, leading to improved environmental performances.
Periodic management review and continuous improvement	The P2 Team provides support for the self-assessment process and use of self-assessment reports in generating P2 documents.

environmental aspects are those that have or can have a significant environmental impact (that is, any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products, or services). The management of environmental aspects, with an emphasis on those that are significant, is key to the success of an EMS. The initial set of significant environmental aspects were identified through the process described below.

3.2.3.1 Identification of LLNL Activities, Products, and Services

A comprehensive list of LLNL activities, products, and services was developed using several existing resources, beginning with the Work and Associated Hazard database used to develop the original LLNL WSS set in 1998 and 1999. This database provided descriptions of buildings and work areas broken into work categories, work elements, work activities, and hazard categories.

A shortened activity list was generated from the database by compiling activities into categories. For example, the laser operations category includes installation, maintenance, repair, and operation of lasers throughout LLNL. The shortened activity list was augmented with activities, products, and services from current integration work sheets (IWSs), the 2005 *Final Site-wide Environmental Impact Statement for the Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS) (U.S. DOE 2005), other ISMS environmental and safety documents, and LLNL personnel knowledge. The initial list of the activities, products, and services was evaluated further by LLNL program and facility personnel, as well as environmental analysts supporting those programs and facilities. In 2006, the list of activities, products, and services was reviewed and revised accordingly.

3.2.3.2 Identification of LLNL Environmental Aspects

The EMS requires that LLNL identify its environmental aspects and associated environmental impacts based on its activities, products, and services. LLNL developed an initial list of environmental aspects by evaluating each activity, product, or service from the list described in the previous section. This initial list of environmental aspects was augmented using other existing resources, such as IWSs, ISMS environmental and safety documents, and LLNL personnel knowledge. The list of environmental aspects (see **Table 3-2**) was evaluated further by LLNL program and facility personnel and environmental analysts supporting those programs and facilities. Significant environmental aspects are discussed in **Section 3.2.3.4**. In 2006, the list of environmental aspects was reviewed, and there were no significant changes.

3.2.3.3 Determination of Environmental Impacts

As environmental aspects were identified, associated environmental impacts were also determined. LLNL utilized existing resources, such as the LLNL SW/SPEIS, ISMS documents, and environmental personnel knowledge to determine the environmental

Table 3-2. LLNL environmental aspects and the significant environmental aspects for calendar year 2006.

LLNL significant environmental aspects	LLNL environmental aspects	
Ecological resource disturbance	Biological material use	Hazardous air pollutant emissions
Electrical energy use	Criteria pollutant emissions	Hazardous waste generation
Fossil fuel consumption	Cultural resources disturbance	Industrial waste generation
Hazardous materials use	Discharges to arroyo/surface waters	Land use/land management
Mixed waste generation	Discharges to ground	Low-level radioactive waste generation
Municipal waste generation	Discharges to sanitary sewer system	Medical/biological waste generation
Nonhazardous materials use	Discharges to storm drain system	Other air emissions (odors, etc.)
Radioactive material use	Energy emissions	Radioactive air emissions
Renewable energy use	Environmental noise	Water use
Transuranic waste generation	Greenhouse gas emissions	

impacts associated with each aspect. In 2006, there were no major changes to the identified environmental impacts.

3.2.3.4 Identification of Significant Environmental Aspects

LLNL developed significance criteria that are used to identify which of the environmental aspects are significant. Development of the criteria included a consideration of both environmental and business factors, as recommended by ISO 14001:1996. See **Table 3-3**.

Table 3-3. Environmental and business factors used in the evaluation of environmental aspects (ISO 14001:1996 guidelines).

Environmental factor	Business factor
Scale of impact	Potential regulatory and legal exposure
Severity and duration of impact	Difficulty of changing impact
Frequency and probability of occurrence	Cost of changing impact Concerns of external and internal interested parties

In 2006, LLNL reviewed and updated its significance criteria to the ISO 14001:2004 guidelines. These criteria are slightly different from those in the ISO 14001:1996 guidelines, which included “ability and cost of change” and “operational and technical limitations.” Both of these criteria, however, are considered when setting environmental objectives and targets and are therefore not considered separately. The updated criteria include the following

seven factors: scale; severity and duration; frequency and probability; laws, regulations, and standards; controls; perceptions; and reuse and recycling opportunities. The updated factors and description of low, moderate, and high impacts are listed in **Table 3-4**. Scoring environmental aspects includes the following assumptions:

Table 3-4. LLNL environmental aspect significance criteria.

Criteria, Requirements, and Concerns	Factor	IMPACTS		
		Low	Moderate	High
Environmental criteria	Scale	Potential impact is localized to the work area or is limited to personnel involved in the work area; OR an accident could result in "Alert" emergency status on site.	Potential impact is contained within LLNL site boundaries; impacts Laboratory population only; OR an accident could result in "Site Area Emergency" on site.	Potential impact is not limited to LLNL sites; impacts surrounding community or region; OR an accident could result in "General Emergency" in surrounding communities.
	Severity and duration	No long-term impact; OR impact is self-remediating.	Impact is recoverable over a long period of time.	Impact is not recoverable or is permanent.
	Frequency and probability	Frequency of occurrence is low (i.e., less than 5% of the number of LLNL related activities).	Moderate frequency of occurrence (i.e., the number of LLNL-related activities is equal to or greater than 5% and less than or equal to 95%).	High to very high frequency of occurrence (i.e., greater than 95% of the number of LLNL related activities).
Applicable legal requirements	Laws, regulations, standards (LRS)	There are no established LRSs to address impact; OR there are established LRSs to address impact, and impact is within compliance requirements.	There are established LRSs to address impact, and impact approaches compliance requirements; OR impact does not result in a regulatory violation/fine.	There are established LRSs to address impact, and impact has exceeded the LRSs reporting thresholds, or fails to meet compliance requirements.
	Controls	No controls needed to mitigate impact.	Identified impact eliminated through the use of controls, engineered or administrative.	Identified impact mitigated to moderate impact level through the use of administrative and engineered controls.
Concerns of internal and external interested parties	Perceptions	Interested parties do not express an opinion; OR no negative or positive opinions of impact.	Interested parties identified impact that warrants monitoring; OR an interested party expresses a strong view (either positive or negative) concerning the impact; OR an interested party's view does not negatively influence other interested parties' perceptions.	Strong views (either positive or negative) concerning the impact are expressed by multiple interested parties; OR expressed views result in increased media attention and/or interested parties oversight and/or public controversy.
	Reuse and recycling opportunities	Minimal or no resource depletion is expected; reuse, recycling or waste minimization opportunities are not available or needed.	Resource depletion is moderate; reuse, recycling, or waste minimization opportunities may be available with some cost avoidance.	Resource depletion is high; reuse, recycling, and waste minimization could significantly reduce impacts to programs, schedules, and/or costs.

- application of both environmental and human health impacts
- impacts that occur both within a facility, exterior to the facility, and beyond the LLNL fence line
- impacts from both normal operations and upset conditions, including the assumptions behind a worst-case scenario

The specific assumptions used to score each LLNL environmental aspect were documented. LLNL's significant environmental aspects for the calendar year 2006 are listed in **Table 3-2**.

As a part of the process for annual review and revision of LLNL's environmental aspects, the LLNL EMS Coordinator and the LLNL EMS Team reevaluate the significance criteria and determine whether any newly identified aspects are significant using a process similar to the one described here. The LLNL EMS Team briefs programmatic and facility organizations on an as-needed basis to advise them of the changes and solicit input to the process of identifying significant environmental aspects.

3.2.4 Identifying and Managing Environmental Objectives and Targets

ISO 14001:2004 requires the establishment and maintenance of documented environmental objectives and targets at relevant functions and levels within the organization. When establishing and reviewing its objectives and targets, LLNL considers legal and other requirements; significant environmental aspects; technological options; financial, operational, and business requirements; and the views of interested parties. The objectives and targets are consistent with the environmental policy, including the commitment to prevent pollution.

LLNL has identified objectives and targets for its significant environmental aspects, the environmental performance indicators (metrics) that will be used to track each target, as well as the projected cost of implementation. Where appropriate, LLNL uses activities and programs that are already in place to achieve objectives and targets. When targets for measuring management of significant environmental aspects cannot be identified easily, studies are performed to establish baselines and determine a path forward. The established set of environmental objectives and targets are reviewed annually (or more frequently if needed) and revised as necessitated by changes to regulatory or program requirements or other influencing factors. The need to develop and implement new objectives is evaluated whenever new significant environmental aspects are identified. **Table 3-5** is a summary of the objectives for LLNL's significant environmental aspects. Targets are listed in **Appendix A**. In 2006, the list of objectives and targets were reviewed and there were no major changes.

3.2.5 Establishing and Maintaining Environmental Management Plans

The objectives and targets for each significant environmental aspect are managed through an Environmental Management Plan (EMP), which assigns tasks and responsibilities for achieving environmental performance goals. The EMP Lead is responsible for collecting information and working with the appropriate LLNL directorate representative(s) to negotiate actions

Table 3-5. Significant environmental aspects and their objectives.

Significant environmental aspect	Objective summary
Ecological resource disturbance	<ul style="list-style-type: none"> • Establish an LLNL policy prohibiting the introduction of exotic species • Educate LLNL employees about the consequences of exotic species introduction • Control exotic species, e.g., feral pig, largemouth bass
Electrical energy use	<ul style="list-style-type: none"> • Meet the objectives provided in DOE Order 430.2A, Departmental Energy and Utilities Management • Implement President's Initiative for Hurricane Relief (September 2005)
Fossil fuel consumption/renewable energy use	<ul style="list-style-type: none"> • Meet the DOE Vehicle Fleet Efficiency goal, in I.106 DEAR 970.5223-5
Hazardous materials use	<ul style="list-style-type: none"> • Prioritize hazardous materials used and perform PPOA to evaluate potential for reduction or substitution
Mixed waste generation	<ul style="list-style-type: none"> • Reduce the amount of mixed and California combined solid waste generated from routine LLNL programmatic operations when economically and technologically feasible
Municipal waste generation	<ul style="list-style-type: none"> • Maintain compliance with applicable regulatory requirements • Prevent/reduce waste generation and increase reuse/recycling of routine and nonroutine waste that would otherwise be disposed of at a municipal landfill
Nonhazardous materials use	<ul style="list-style-type: none"> • Incorporate affirmative procurement site-wide • Increase site-wide use of products with recycled content
Radioactive material use	<ul style="list-style-type: none"> • Conduct study to evaluate radioactive material impacts at LLNL and identify potential opportunities for reduction
Transuranic waste generation	<ul style="list-style-type: none"> • Conduct a study to review the characterization of transuranic waste to ensure generation of nonconforming waste is minimized and characterization is accurate to maximize the ability to disposition the waste.

to be incorporated in the EMP. Each EMP includes tasks with schedules, resources, operational controls, generated records, environmental performance indicators, monitoring and measurement, and task responsibility and authority. Where appropriate, documents that define operational controls applicable to the EMP (e.g., IWSs, studies, mitigations required by NEPA) are referenced. The EMP Lead works with the directorate representative(s) and the EMS Team when preparing the EMP.

The EMS Coordinator and the EMS Team review progress on each EMP annually (or more frequently if needed) and work with EMP Leads to revise EMPs as necessary. The EMS Coordinator and EMS Team ensure that new EMPs are developed and implemented as needed. In 2006, progress was made on the existing EMPs, including completion of studies (see **Appendix A**).

3.2.5.1 Directorate EMS Representatives

In December 2006, the Director of LLNL issued a memo requiring that each directorate identify a representative to coordinate implementation of ISO 14001 within the directorate. The roles and responsibilities of the directorate representatives are to

- participate in EMS Team meetings and related activities
- work within their directorates to develop appropriate objectives, targets, and EMPs to achieve those targets
- integrate the ISO requirements into business/operational planning, as well as the continued integration into activity planning
- implement a means to measure and document successes in meeting the directorate's objectives and targets and track areas needing improvement within the directorate and provide reports on a periodic basis
- incorporate environmental considerations as a full partner in the directorate's decision-making process
- work with the EMS Team to review institutional procedures and representing the organization's perspective in the management of ISO responsibilities
- encourage directorate staff's environmental awareness

In 2007, the directorates will begin to incorporate ISO 14001:2004 within all relevant functions and levels of their organization.

3.2.5.2 Senior Management Review

ISO 14001:2004 requires senior management reviews of the EMS at least annually (more frequently if needed). Each review must be comprehensive but not all elements of the EMS are required.

The EMS Coordinator prepares the necessary input to be considered in the management review. The following topics are typically included:

- review of environmental objectives and targets and the extent to which they have been met
- findings of EMS audits and results of directorate self-assessments
- regulatory compliance status
- follow-up actions from previous audits
- changing circumstances, including developments in legal and other requirements related to significant environmental aspects

3.2.5.3 Recommendations for Improvement

Upon review of the above information, senior management determines the continuing effectiveness of the EMS implementation, specifically the ability of LLNL to achieve its

documented objectives and targets. Senior management also determines whether the system continues to be adequate and suitable for its intended purpose.

Having made these determinations, senior management provides a response to the EMS Coordinator that includes any changes that must be made to the EMS to ensure its continual improvement. Senior management directives may include changes to the environmental policy, objectives and targets, and other elements of the EMS.

A senior management review was not conducted in 2006; it was postponed by the EMS Coordinator due to the initial implementation of the Laboratory's EMS and the desire to have the review coincide with the Directorates' annual self-assessments.

3.2.6 LLNL's Self-Declaration Process

To conform with the requirements of Executive Order 13148, Greening the Government Through Leadership in Environmental Management, LLNL initiated an internal review process to facilitate self-declaration of conformance with ISO 14001:1996. An internal EMS audit was conducted on November 9 and 10, 2005.

Subsequent to the internal audit, NNSA/LSO also conducted an independent audit of LLNL's existing EMS against the requirements specified in ISO14001:1996. The purpose of the audit was to fulfill the NNSA/LSO requirement to conduct an independent review and determine whether the LLNL EMS met the intent of ISO 14001:1996, was being implemented, and was effective. The NNSA/LSO audit resulted in the following findings:

- no major nonconformances (a major nonconformance is a missing system element or evidence that a system element is not implemented or not effective)
- 13 minor nonconformances (a minor nonconformance is a single observed discrepancy in the system with evidence that the overall system is defined, implemented, and effective)
- 8 observations (an observation is not a nonconformance but something that could lead to a nonconformance if allowed to continue uncorrected, or an existing condition without adequate supporting evidence to verify that it constitutes a nonconformance)
- 20 opportunities for improvement (OFI) (an OFI is a suggested or recommended means of accomplishing an activity, fulfilling the intent of a procedural requirement, or improving the efficiency or effectiveness of the EMS)
- 22 noteworthy practices (a noteworthy practice is performance that exceeds expectations in terms of efficiency and/or effectiveness and provides a model for others to follow)

NNSA/LSO agreed to validate the self-declaration of LLNL's EMS upon submittal of a draft CAP that contained corrective actions specific to the minor nonconformances identified in the NNSA/LSO audit. LLNL prepared the draft CAP and submitted it to LSO on December 20,

2005. LLNL and LSO agreed that observations and OFIs would not be addressed in the CAP but would be entered and tracked to closure in the LLNL Issues Tracking System (ITS).

On December 22, 2005, LLNL provided DOE with a self-declaration of LLNL's EMS based on the audit performed by NNSA/LSO and the draft CAP that was submitted.

During 2006, LLNL completed all but one of the corrective actions that address the minor nonconformances identified in the NNSA/LSO audit; the final item was completed in January 2007. In addition, LLNL submitted the ISO 14001:2004 standard to the WSS Change Control Board, and it was added as a WSS. Subsequently, LLNL began the process of updating the existing EMS to meet the requirements of the ISO 14001:2004 standard.

3.2.7 Path Forward

During 2007, LLNL will continue to incorporate EMS at relevant functions and levels of the organization with the assistance of the newly appointed directorate EMS representatives. The representatives' goal is to develop directorate-specific environmental objectives and targets by April 2007 and begin implementation of the directorate-specific EMPs by September 1. LLNL will continue to work toward meeting its institutional-level environmental objectives and targets and will perform reviews and measurements to ensure they are appropriate and that progress is being made.

3.3 Pollution Prevention Program

The LLNL Pollution Prevention (P2) Team facilitates LLNL's P2 Program within the framework of the ISMS and EMS and in accordance with applicable laws, regulations, and DOE orders as required by the DOE/UC/LLNL contract. P2 Team responsibilities include P2 Program stewardship and maintenance, waste stream analysis, reporting of waste generation and P2 accomplishments, and fostering of P2 awareness through presentations, articles, and events. The P2 Team supports institutional and directorate P2 activities via environmental teams, including implementation and facilitation of source reduction and/or reclamation, recycling, and reuse programs for hazardous and nonhazardous waste, facilitation of environmentally preferable procurement, preparation of P2 opportunity assessments, and development and management of high return-on-investment projects. LLNL's P2 Program is described in the *ES&H Manual*, Document 30.1, Managing Environmental Aspects Through Pollution Prevention.

The P2 Program at LLNL strives to systematically reduce solid, hazardous, radioactive, and mixed-waste generation, and to eliminate or minimize pollutant releases to all environmental media from all aspects of the operations at the Livermore site and Site 300. These efforts help protect public health and the environment by reducing or eliminating waste, improving resource usage, and reducing inventories and releases of hazardous chemicals. These efforts also benefit LLNL by reducing compliance costs and minimizing potential civil and criminal

Table 3-6. Routine hazardous and radioactive waste at LLNL, FY 2004–2006.

Waste category	FY 2004	FY 2005	FY 2006
Routine hazardous waste generated	141.3 MT	127 MT	153 MT
Routine low-level waste generated	151.3 m ³	54 m ³	66 m ³
Routine mixed waste generated	18.8 m ³	16 m ³	18 m ³
Routine TRU / mixed TRU waste generated	1.2 m ³	1 m ³	1 m ³

liabilities under environmental laws. In accordance with Environmental Protection Agency (EPA) guidelines and DOE policy, the P2 Program uses a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and treatment and disposal), which is applied, where feasible, to all types of waste. The P2 Team tracks waste generation using the HazTrack database. By reviewing the information in this database, program managers and P2 Team staff can monitor and analyze waste streams to determine cost-effective improvements to LLNL operations.

3.3.1 Routine Hazardous and Radioactive Waste

Routine waste described in **Table 3-6** includes waste from ongoing operations produced by any type of production, analysis, and/or research and development taking place at LLNL. Periodic laboratory or facility clean-outs and spill cleanups as a result of these processes are also considered normal operations. Residues, resulting from the treatment of routine waste, are not included to avoid double counting.

3.3.2 Diverted Waste

LLNL maintains an active waste diversion program, encouraging recycling and reuse of both routine and nonroutine waste.

3.3.2.1 Routine Nonhazardous Waste

Together, the Livermore site and Site 300 generated 4107 metric tons (MT) of routine nonhazardous solid waste in fiscal year (FY) 2006. This volume includes diverted waste (e.g., material diverted through recycling and reuse programs) and landfill waste.

Both sites diverted a combined total 2601 MT of routine nonhazardous waste in 2006, which represents a diversion rate of 63%. The diverted routine nonhazardous waste includes waste recycled by RHW and materials diverted through the surplus sales program. The portion of routine nonhazardous waste sent to landfill was 1506 MT. See **Table 3-7**.

3.3.2.2 Nonroutine Nonhazardous Waste

Nonroutine nonhazardous solid wastes include excavated soils, wastes and metals from construction, and decontamination and demolition activities. The Livermore site and Site 300

Table 3-7. Routine nonhazardous waste in FY 2006, Livermore site and Site 300 combined.

Destination	Waste description	Amount in FY 2006 (in MT)
Diverted	Batteries, small ^(a)	1
	Batteries, lead-acid ^(a)	31
	Beverage containers	5
	Cardboard	135
	Compost	504
	Cooking grease	2
	Magazines, newspapers, phone books	19
	Metals	1412
	Paper	207
	Street sweepings	93
	Tires and scrap	20
	Toner cartridges	12
	Wood	160
	TOTAL diverted	2601
Landfill	Compacted (landfill)	1506
	TOTAL landfill	1506
TOTAL routine nonhazardous waste		4107

(a) Batteries are managed as universal waste.

Table 3-8. Nonroutine nonhazardous waste in FY 2006, Livermore site and Site 300 combined.

Destination	Waste description	Amount in FY 2006 (in MT)
Diverted	Class II cover (soil reused at landfill)	1234
	Asphalt/concrete	10,545
	Nonroutine metals	2544
	TOTAL diverted	14,323
Landfill	Construction demolition (noncompacted landfill)	1502
	Industrial (HazTrack) ^(a)	159
	Non-friable asbestos	8
	TOTAL landfill	1669
TOTAL nonroutine nonhazardous waste		15,992

(a) RHWM Waste Data Management Systems

generated a total of 15,992 MT of nonroutine nonhazardous solid waste in 2006.

In FY 2006, 14,323 MT of nonroutine nonhazardous solid waste was diverted through reuse or recycling, which represents a diversion rate of 90%. Diverted nonroutine nonhazardous solid waste includes soil reused either on site for other projects or as cover soil at Class II landfills, and metals recycled through the metals recycling programs. Only 10% of nonroutine nonhazardous waste was sent to landfill. See **Table 3-8**.

3.3.3 Pollution Prevention Activities

In December 2006, NNSA/Headquarters selected one project at the Livermore site and one project at Site 300 to receive P2 awards. Both projects received NNSA Best-In-Class awards, and the Site 300 project was recommended for submittal to the White House 2006 Closing-the-Circle (CTC) competition. The CTC program recognizes outstanding efforts and achievements of federal employees and their facilities in promoting environmental stewardship.

The Livermore site Best-in-Class award was categorized as Official Use Only and was recognized only at the NNSA level due to the classified subject matter.

The Site 300 Best-in-Class award recognized four recent measures that resulted in significant reductions in water use through recycling, environmental conservation, and improved efficiency of operations. Overall, the project saved about 9.7 million gallons a year (gal/yr), representing 41% of the total average water use at Site 300. The project also saved over 68,000 kilowatt-hours (kWh) in electric power annually from reduced pumping activities.

The first measure involved implementing a series of innovative approaches to water use and recycling at the Contained Firing Facility. These efforts save nearly 100,000 gal/yr of potable water through recycling. These improvements also reduced the amount of solid waste generated by 67% from the previous year.

The second measure saved 5790 kWh in electric power from pumping activities by replacing two nonhazardous wastewater impoundments with surface storage tanks.

A third measure focused on rehabilitating selected areas as wetlands, allowing the site to discontinue maintenance of an artificial wetland. This saves approximately 8 million gal of potable water annually and 58,780 kWh/yr of electric power used for pumping. The California red-legged frog, a federally threatened species, is thriving in the rehabilitated in-stream pool habitats created in Elk Ravine, validating the project's success.

A fourth measure, replacing four cooling towers with closed loop-systems, resulted in a recurring annual savings of 3590 kWh of electric power.

These combined efforts represent proper stewardship of Site 300 environmental resources, improved operations and a cost-effective approach to regulatory compliance. Each action provides for lasting impacts by reducing or eliminating potable water usage and wastewater discharges.

Another water savings project was implemented at the Livermore site during FY 2006. This involved the installation of a waterjet equipped with a water recycling system. The waterjet cutting system was selected to replace existing labor-intensive cutting equipment, such as lathes, milling equipment, and saws. The water recycling unit was installed in conjunction with the waterjet equipment as a proactive P2 effort, potentially saving over 40,000 gal/yr.

3.3.4 Review of New Processes, Programs, or Experiments

During 2006, a significant portion of the P2 Team effort was in support of the planning and implementation of LLNL's EMS. See **Table 3-1** for an overview of the interrelationship between P2 and the EMS. The EMS Team included representatives from Pollution Prevention; their efforts during 2006 are described in **Section 3.2.2**.

3.3.5 Pollution Prevention Employee Training and Awareness Programs

In 2006, LLNL conducted a number of activities to promote employee awareness of pollution prevention. A key event, the annual Earth Expo, was held in April to coincide with Earth Day. The 2006 focus was "Environmental Stewardship of LLNL." An array of on-site organizations presented posters to increase LLNL staff awareness of the environmental functions carried out by EPD, Business Services, and the Energy Management Program. The P2 Team also participated in the on-site Environmental, Health, and Safety Fair in June.

The P2 team also conducts other awareness activities during the year. Articles on pollution prevention appeared in *Newsline* (the LLNL newspaper) and *NewsOnLine* (the LLNL electronic newsletter). The P2 Team conducted training for purchasing staff on EPA requirements

for affirmative procurement. The P2 Team also placed banners at entry gates for America Recycles Day.

The P2 Team maintains an internal P2 website for LLNL employees. The website is a resource for employees regarding pollution prevention, energy efficiency, reuse and recycling of materials, green building, and other environmental topics. Employees can also use the site to suggest P2 ideas, ask questions about P2 planning and implementation, and find out about P2 current events. The P2 Team also operates the Earth Hotline for employees to call with questions, suggestions, or ideas regarding LLNL's pollution prevention and waste diversion endeavors.

Contributing Authors

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